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ABSTRACT

This study examined the allocation of government research grants to universities in the United Kingdom in the context of the current funding system which distributes such grants based on universities' performance in the marketplace. Marketplace performance indicators include academic staff and postgraduate student counts, grants from Research Councils, income from contracts with industry, donations, and research ratings. Research grant data were analyzed to determine if the allocation of research grants reflected the performance indicators outlined in the funding methodology. A multiple regression analysis was used to determine the relationship between indicators and allocation of grants in the academic years 1990-91, 1991-92, and 1992-93. The results showed that the funding formula was used to allocate research grants to the 50 long-established United Kingdom universities with a large coefficient of multiple determination in the three years examined. A large proportion of grants were explained by the performance indicators: 73.1 percent in 1990-91, 80.9 percent in 1991-92, and 86.2 percent in 1992-93. (Contains 45 references.) (JLS)

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A CASE STUDY OF SELECTIVE FUNDING OF RESEARCH IN THE UNITED KINGDOM THROUGH ASSESSMENT OF SOME UNIVERSITY INDICATORS (1990/91 TO 1992/93).

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ABSTRACT

The UK higher education system has suffered profound changes since 1981, such as large cuts in public funding, expansion of student intake and an increase in non-government resources. The grant allocation process has included peer-review judgement, national research assessment as part of the University Grants Committee methodology funding for research and competitive bidding for teaching. Selectivity has been used to allocate grants to research and supposedly to protect it from the large cuts. Since 1986 the funding methodology has measured universities' performance in the market in order to distribute research grants. Selective funding continues into the 1990s, resulting in increased competition among the universities for continually reduced public funds.

INTRODUCTION

This paper analyses the funding methodology for research, which was created in 1985 by the University Grants Committee (UGC). It implemented a new funding methodology in 1986, which was followed by its successor the Universities Funding Council (UFC). The funding methodology involves assessment of university performance in relation to some chosen indicators. It measures the universities' capability to attract resources from non-government sources, teachers and post-graduate student numbers and ratings from national research selectivity exercises. The performance indicators are presented in the Circular letters to Vice-Chancellors and Principals issued by the UGC and the UFC. These indicators include: academic staff and postgraduate student numbers, grants from Research Councils, income from contracts with industry and commerce, donations from charitable organisations and research ratings. National external research assessment exercises were carried out in 1986, 1989, 1992 and 1996. Data from the first exercise was not available. This was an impediment for testing the relationship between grants and performance indicators from 1986/87 to 1989/90. The analysis of a complete list of variables could only be made for three academic years: 1990/91, 1991/92 and 1992/93. Since 1993/94, a different methodology has been used to allocate resources to universities by newly formed funding Councils for England, Scotland and Wales.

Although financial reductions and selectivity have been implemented for more than one decade, there is no systematic study of the relationship between grant allocation and university performance across the university sector. The aim of this paper is to fill this gap, examining if there is a relationship between grant allocation and university performance. There has been a considerable decrease in grants since 1981 and a constant official discourse of 'value for money' and 'more accountability'. This subject raises the following questions: What was the criteria used? Does it really measure university performance? Have universities been equally treated according to the chosen performance indicators? What could possibly be the most influential performance indicators in the new allocation process?

PURPOSE

This paper will show if the allocation of grants for research reflects the figures of the performance indicators cited in the funding methodology. It involves complete data available from the fifty long-established UK universities in the academic years 1990/91, 1991/92 and 36 from 1992/93.

The first step is the examination of the political changes in grant allocation to universities. It involves identification of the basis of grant reductions, and moreover, shows how the Funding Councils have administered them. It provides a means of analysing the aims, requirements and procedures responsible for such financial changes.

The second step consists of the presentation and analysis of the new methodology of allocation of grants through Circular Letters issued by the UGC and the UFC to Vice-Chancellors and Principals. The Circular Letters have been the primary source of information about the creation and evolution of the new system of grant allocation.

The third step considers whether performance indicators used in the funding methodology followed up on research grants allocated to the fifty long-established universities from 1990/91 to 1992/93 or not. It used research grant figures from the recurrent grants listed in the Circular Letters issued by the UFC to the Vice-Chancellor and Principals and data related to the components of the funding methodology.

The fourth step consists of the analysis of test results of the relationship between performance indicators from the UGC's formula and allocation of research grants. It shows to what extent the indicators of university performance have been used in the allocation of grants each academic year. It shows a plot of residuals against the dependent variable. It presents the critical meaning of the results achieved. It also identifies the main impacts of the new allocation system on the universities. It includes an overall view of their effects on the universities and some comments.

RATIONALE

The changes introduced in university funding since 1979 involve a set of governmental aims. Two major policies have been the basis for the changes implemented since 1979. The first has been an increasing shift from public grants to private financial sources. The second has been increasing accountability of public money used by universities, Jarratt (1985), DES (1985) and several the UGC and the UFC Circular Letters to Vice-Chancellors and Principals.

The UK government has introduced profound changes in the university financing. These changes have been the result of a policy of market competition as opposed to one of a Welfare State. They have been based on "rolling back the borders of the State" and have led to cuts in public expenditure. This policy has been in effect since 1979 when the Prime-Minister stated that "the House of Commons could expect a heavy programme, designed to reverse socialism, extend choice and widen property ownership", Thatcher (1993). For this reason, a high level of public expenditure has been considered harmful to the national income. Government subsidies to universities have been considered a stimulus to financial "dependence" that obstructs their efficiency. The government stated, particularly, that it was necessary to increase the effectiveness of resources allocated to research in institutions of higher education. In order to do this the government planned to concentrate research grants in a few centres of excellence as they were considered "too thinly spread". Therefore, selectivity and concentration would be the principles used in the distribution of research grants, DES (1985).

The first reduction in grants was made in 1979 to cut subsidies for overseas students in the UK. The sharpest cuts in recurrent grants to universities were selectively made over a period of three years from 1981. They varied from 44% to 6% with an average of 17%, accompanied by other cuts in following years, Jarratt (1985). Selective reductions in grants could be interpreted as a government strategy to introduce and consolidate higher education in the market system. For this reason, it was necessary to break down the belief in the uniformly high standard of universities and institute competition between them. Their different levels of "efficiency" would result in differential cuts in grants.

Since 1981 selectivity has been used by the UGC, and subsequent funding councils, as their methodology for university financing. In 1985 the Jarratt Report in 1985 made the first recommendation to create authoritative performance indicators to measure university quality for funding purposes. The government accepted the report, as stated in the Green Paper entitled "The Development of Higher Education into the 1990" also published in 1985, months after publication of the Jarratt Report. The government required performance indicators to enable comparison between cost centres and universities. The development of performance indicators also represented an attempt to transform a non-systematic decision-making process into an objective grant allocation process.

Performance indicators were expected to be a reliable tool in the assessment of academic "production", university management and allocation of grants. Owing to their nature, they simplify reality and facilitate assessment and comparison among universities. They represent an attempt to quantify quality. This leads to a question about the definition of quality. There are different concepts of quality including the traditional one based on the idea of excellence with exceptionally high standards of academic achievement; perfection or consistency with the aims established; fitness for the purpose of achieving the institutional mission or the aims of its study programmes; or value for money in which the quality is measured according to the return on investment made, Quality of Higher Education (1995). This last concept has been used by the government in the last decade, moreover it underpins the use of performance indicators for funding allocation. They were supposed to demonstrate whether universities used the taxpayers' money efficiently or not. In addition, the Council of Vice-Chancellors and Principals (CVCP) and the UGC Report accepted the concept of quality as value for money and the classification of input, process and output in the development of performance indicators. Input indicators would be related to the financial resources and personnel employed by universities. Process would be concerned with the intensity of the use of resources available, and management performance with input and the conduct of the institution. Output would indicate the "products" achieved by the institution. In the conception of Working Group formed by the CVCP and the UGC, performance indicators would be a more tentative than exact measurement of inputs, processes and outputs, although they could offer valuable information related to them, Cave, Kogan and Smith (1990).

The Funding Councils external research selectivity exercises represented the first attempt in any developed country to make a national assessment of the quality of university research. The first exercise carried out in 1985 was

largely criticised for a lack of consistent criteria. It was based on money for research as part of the total grant with the largest part of the grant determined by in student numbers and their respective historical cost data. The subjects were classified in thirty-nine costs centres to identify the cost of each one. It involved peer-review judgements and the evaluation of a sample of five publications from each cost centre, as well as supporting data from Research Councils, foundations, government departments, new blood posts and published tables in academic journals. Although the 1989 selective assessment exercise adopted peer-review judgements, far more emphasis was placed on data concerning publications. According to the Circular Letters, the 1989 ratings would be used by the UFC as a methodology component to fund research for the academic year 1990/91. In that exercise, each academic would list a maximum of two publications in which she or he was sole or co-author from January 1984 to 31 December 1988. The Councils' advisory groups and subject panels relied on the same single 5-point rating scale and common interpretation among different subjects, which means that 1989 ratings of different subjects were internally consistent. The 1992 selective research assessment exercise differed in some ways from previous ones. It was voluntary and open to former polytechnics and colleges of higher education. The institutions had to provide information about the number of staff actively undertaking research and their best two pieces of research, for example articles, books, sculptures, musical performances, etc., as well as postgraduate numbers per department, future departmental research plans and the amount of non-governmental research income of each department. In order to calculate the results, each rating was multiplied by the number of active staff in the department assessed. All the totals for the institution were added up, then divided by the total number of active research staff to arrive at an average rating.

PERFORMANCE INDICATORS USED FOR CALCULATION OF GRANTS

Until 1985, the UGC had relied exclusively on peer-review assessment for the distribution of grants. In 1985, it created a funding methodology to be used in the calculation of grants for each university. Although the means of constructing reliable and consistent performance indicators was still subject to discussion, since 1986/87 the funding councils have used a set of components in its formula for research funding.

Several UGC and UFC Circular Letters to Vice-Chancellors and Principals presented the complete methodology, its first implementation and later alterations. They were, in reality, funding components used for allocation of grants for research, although a mathematical formula funding was not presented. The UGC stated that they were used in the calculation of grants for research, UGC (1985).

The UGC aimed to use its funding methodology to deal with constraints on the allocation of grants through selective quality assessment. It involved separating funding for research, teaching, central administration and special factors, and it based its policy of selective distribution on these. This separation was the central point of a "new policy of grant allocation". It was the beginning of the implementation of the new grant allocation process. Research and teaching, two of the most important areas of academic institutions, would be funded according performance indicators chosen by the UGC. In addition to the classification of central administration expenditure, the remaining expenditures would be treated as special factors. The amount of grant allocation would be defined on the basis of each departmental cost centre's performance instead of the whole institution, as had previously been the case.

The basis for the new allocation process represented a complex change. It was considered a break with tradition. Until 1985 the distribution of grants was made according to the concept of deficiency funding, UGC (1986). According to that system, the government used to cover the gap between the total university expenditure and the resources that they obtained from private sources, to cover the cost of the number of students previously agreed upon with the UGC, as well as expenditures on previous commitments. The UGC understood that those commitments would be unfair criteria for consideration in the distribution of grants between universities, as they were not taken on at the same time and for the same reasons. That system did not require an explicit consideration of non-governmental income received by universities. As a consequence, it did not stimulate increasing income from industry, commerce, charitable bodies and individuals. According to the UGC, universities considered that system obscure and asked for the implementation of a more rational one. A new method of grant allocation based mainly on teaching and research criteria was therefore introduced thus invented by the UGC. This would replace the old one based on deficiency funding. The universities would then be assessed using the same criteria.

The first step in the allocation process was "to consider student number and research, and the related resources, by academic area", UGC (1985). In this sense, the UGC would undertake some important tasks up to the target year of 1989/90. They would include the forecast of total numbers of UK home and European community (EC) students and of grants; the distribution of these numbers among academic subject groups and departmental cost centres; and the allocation of student numbers and resources among universities. The UGC would be supported by its sub-committees on the preliminary decisions of how to allocate student numbers and grants. Completing the process, regional groups would make the final decision, UGC (1985).

The allocation process would need to include a calculation of fee income from the expected student numbers of both home and EC students. From these resources the UGC would subtract any amount distributed on a different basis from the block grant, besides maintaining a reserve for contingencies and for new policies. After such deductions, the resources remaining and they were divided into three main components: teaching-based criteria, research-based criteria and special factors. The allocation of research grants would be based on the university's performance indicators. They would be as follows :

- "... Resources distributed on criteria related to staff and research student numbers. (This is the "floor" provision for research.)
- Resources distributed on the basis of income from Research Councils and charitable bodies.
- Resources distributed on the basis of contract research income.
- Resources selectively distributed on judgement.

In addition, the component S is made up of two parts:

- Allowance for non-departmental special factors.
- Allowance for departmental special factors", UGC (1985).

These special factors represent existing institutional commitments. The elimination of these commitments would not be desirable from the viewpoint of the universities or the UGC. They also could not be easily classified as part of the teaching and research resource process. The majority of such commitments would be related to a departmental cost centre, where the respective resources should be allocated. On the other hand, the non-departmental special factors would be those which could not be assigned to a departmental cost centre.

After determining grant allocation up to 1989/90 according to the above-mentioned criteria, the next step would be the deduction of the estimated fee income contributed by planned student numbers of home and EC students. Therefore, the basic block grants for 1986/87, and provisional grants until 1989/90, would be defined by the UGC criteria associated with the Department of Education and Science information about total recurrent resources for the planned years. Expenditure of some items defined according to different criteria from those mentioned above were also planned to be added to the distribution of grants in 1986/87 distribution. They were related in particular to continuing education and to the Engineering and Technology Program. In addition, limitation of the changes in the new allocation process was announced by the UGC. The aim was to protect the universities from drastic reductions. For the 1986/87 fiscal year, for example, a safety net was used to prevent any university from receiving, on average, a grant distribution less than 1.5% of the previous year's grant. It was also an attempt to reintroduce a planning period to avoid cuts in the recurrent university grants at short notice. The first funding period would be from 1986/87 to 1989/90.

The teaching-based criteria would not be broken down any further. Specific criteria to assess and fund teaching was not yet available. Instead, the Council would consider the planned student numbers by cost centre and category, undergraduate or postgraduate, based on the data provided by universities. Such methodology for teaching funding was criticised because grants for teaching comprised the sum of allocations from all cost centres in each institution, without taking into consideration the fact that each cost centre has a different cost per student across the UK. At the same time, the student numbers on which the allocation was based were achieved by planning totals agreed upon between the universities and the UGC. There was no compensation for different entrance levels of new students. In conclusion, a performance indicator for allocating grants for teaching did not involve explicit quality criteria; quantities were based on unspecified principles, Cave at al (1990).

METHOD USED TO TEST THE RELATIONSHIP BETWEEN GRANTS AND PERFORMANCE INDICATORS

Statistics related to the UGC funding methodology were available from 1986/87 to 1993-94. However, data for research funding will be analysed during three academic years because the first research ratings were not available for analysis. It is an important point for this research as such ratings were used in the allocation of grants from 1986-87 to 1989-90. It prevented an analysis of that first four year period. The results of the next selective research assessment exercise carried out in 1989 were obtained for examination. They were used in grant calculations since 1990-91. The results of the third selective research assessment exercise were published in 1992 and used in grant calculations in 1993-94. Nevertheless, this last academic year could not be analysed with the same methodology because of changes in the funding formula for research, UFC (1993). From 1993/94 onwards, the new Funding Councils for England, Scotland and Wales and the Department of Education for Northern Ireland decided to issue documents about their own methods for funding research. The new funding formula for England, for example, is comprised of the following components: quality and volume of research, contract work on full cost recovery basis, development of research potential in specific areas outside existing centres or research excellence and Applied Research Ratings, which receive 20% of the total available funds for allocation within each unit, UFC (1993). Therefore, the set of available data for examining research funding is complete only from 1990-91 to 1992-93. For this period, the relationship between the performance indicators and government grants for research can be measured straightforwardly. It will show if the new methodology for grant allocation selectively rewarded efficient institutions and punished the inefficient. Therefore, a multiple regression analysis will "explain" the extension of the relationship between the performance indicators' figures and allocation of grants for research in the academic years of 1990-91, 1991/92 and 1992-93.

DATA ANALYSIS AND RESULTS:

A multiple regression analysis calculation was made by using the amount of resources allocated to research by the UFC and some performance indicators. Research grants are also included in the Exchequer Grants as well as grants for teaching and special factors (special libraries, museums, etc.). Such research grants were used as a dependent variable in the regression analysis. The independent variables were the performance indicators that form the funding formula used in the calculation of research grants by the UFC. In addition, the dependent and independent variables were divided by the number of academic staff wholly university funded. The purpose of this procedure was to avoid the influence of the university size in the results of the regression analysis. However, it was not sufficient to avoid the influence of the size of the University of London, because its large share of the budget of English universities which is about one third of the total. As a result this university was excluded from the regression model for the 1990/91, 1991/92 and 1992/93 academic years. For the first two years, data from 49 long-established universities in England, Wales and Scotland were used in the regression analysis. For the last year only 34 English universities were involved due lack of data.

The dependent variable was formed by the resources allocated to research by the UFC. The independent variables are those used as performance indicators for funding calculations. The list below shows the variables tested in the regression model:

RC: Grants from Research Councils.

CH: Donations from Charitable Bodies.

CG: Income from contracts with Central Government Bodies.

IND: Income from contracts with U. K. Industry.

WSTUD: Weighted student numbers. It is the sum of: undergraduate=1, taught postgraduate=1.2, research postgraduate=2 and overseas students=1, Mace (1995).

RRAT: Research ratings from selective research assessment exercise carried out in 1989 and used from 1990/91 to 1992/93.

AF: Academic staff wholly university funded.

Another point to be considered is that the performance indicators for one year were used in the calculation of the research grants for the next year. Therefore, in the calculation of the regression analysis, the dependent variable of 1990/91, for example, involves the research grants from 1991/92.

Some of the variables cited above were included in the multiple regression model in one year but not in the next. The best model of multiple regressions for each year was chosen through Stepwise regression that selected the most significant variables Ryan and Joiner (1994).

In 1990/91, the following variables entered the regression model: income from Research Council (RC), Charitable Bodies (CH), commercial contracts with Central Government Departments (CG), European Community (EC) and research ratings from national selective research exercise (RRAT). The variables income from UK Industry (IND) and weighted student numbers (WSTUD) were not significant for the regression analysis model in this year nor in the next year. In the last year the variable CG was not statistically significant. Therefore, the regression equation in 1990/91 was the following:

```
r912a901 = 7.88 + 0.361 RC/AF901 + 0.242 CH/AF901 + 0.310 CG/AF901
           + 1.00 EC/AF901 + 2.14 RRAT9091
```

In the regression model, the t-value corresponding to 48 degrees of freedom, 95% confidence level is 2.0. The coefficient of multiple determination explains 73.1% of the resources allocated to research. It is considered a reasonable result. It also shows that, through the linear combination cited above, 26.9% of research grants were due to other reasons not explained by the informed funding methodology, perhaps some In this first model the most significant variable according to statistical t-ratio and p-value: income from Research Councils (RC), Charitable Bodies (CH), European Community (EC) and Research Ratings (RRAT). Income from Central Government Departments (CG) was barely statistically significant.

The residuals plotted against universities test how selective grant allocation was made considering the indicators established by the Funding Council. Figure one below shows random dispersion, in which those universities that

received more resources than those predicted by the regression model are above zero and those which received less are below zero. Anyone of the universities were considered extremely scattered, because any residual was above four standard deviations. The first university was the most scattered. Nevertheless, it can not be considered an extreme discrepancy, because it is less than four standard deviations from zero. The first university received £7.17 thousands more per academic staff than predicted. There were also two most scattered with negative standard residuals, that means, that they received less than their predicted allocation: university number 20 (£-3.70) and university number 44 (£-2.12) thousands per academic staff.

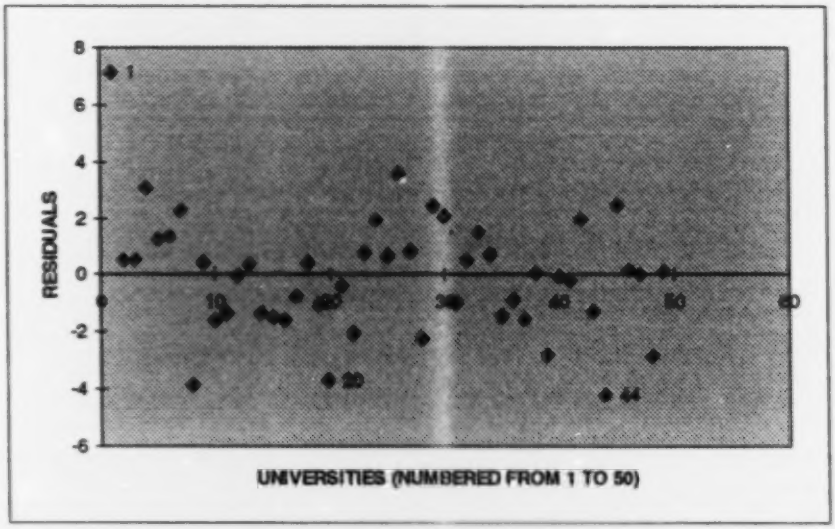

FIGURE 1 - RESIDUAL PLOT AGAINST PREDICTED RESEARCH ALLOCATION USING PERFORMANCE INDICTORS FROM 1990/91

In 1991/92 the same performance indicators were used in the regression model, (including RC, CH, CG, EC and RRAT). For this year logarithm transformation was used because the errors did not have a normal distribution (and did meet one of the basic presuppositions of the parametric model). Therefore, the regression analysis equation was as follows:

```
LOGER/A = 2.27 + 0.0273 RC/AF912 + 0.00895 CH/AF912 + 0.0170 CG/AF912
          + 0.139 RRAT9091 + 0.0438 EC/AF912
```

For 1991/92, the coefficient of multiple determination shows a list of five performance indicators that explain 80.9% of the resources allocated to research. It shows a higher result than in the previous year. It also shows that 19.1% of research grants were due to other reasons. Other variables not mentioned in the funding methodology explain this difference in research grants.

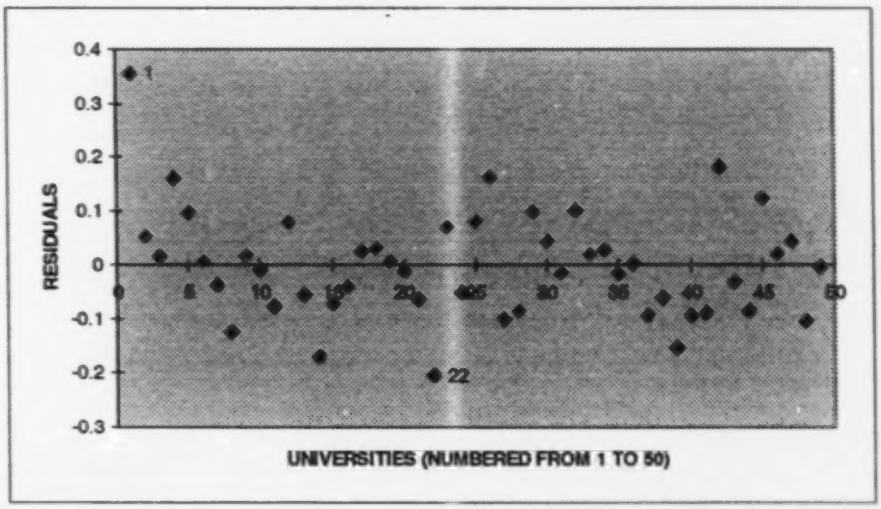

FIGURE 2 - RESIDUAL PLOT AGAINST RESOURCES ALLOCATE TO RESEARCH USING PERFORMANCE INDICATORS FROM 1991/92

For this year there are also two most scattered universities. The first one received £350 more per academic staff than its predicted amount. The others received fewer resources than their predicted amounts. The university that suffered the most was number 22, which received £200 less per academic staff. In this second model the most significant variables according to statistical t-ratio and p-value: income from Research Councils and Research Ratings. The variables European Community and Central Government Departments were significant, but income from Charitable Organisations was barely statistically significant.

For 1992/93, due to the lack of data, only 34 out of 36 long-established universities from England were analysed. In this third model, the following variables entered the regression analysis: income from Research Councils (RC), Charitable Organisations (CH), Weighted Student Numbers (WST), grants from European

Community (EC) and Research Ratings (RRAT). The t-value corresponding to 33 degrees of freedom and 95% confidence is 2.01. The regression analysis equation was as follows:

The regression equation is

R934a923 = - 2.49 + 0.390 RC923/AF + 0.252 CH923/AF + 0.243 WST/A923
+ 3.54 RRAT9091 + 0.687 EC923/AF

The coefficient of multiple determination shows that the list of five performance indicators explains 86.2% of the resources allocated to research. Among the three models of regression it is the highest result. This is an important result considering as UFC information from Circular Letters indicates that it increased the selectivity even more. Increasingly research grants have been allocated according to the funding formula and objective criteria. It shows yet that 13.8% of research grants were not explained by the cited performance indicators. In this third model the most significant variables according to statistical t-ratio and p-value: Research Ratings (RRAT) was highly significant followed by Research Councils (RC). The last three were barely statistically significant: Weighted Student Numbers (WST), income from Charitable Organisations (CH) and European Community (EC).

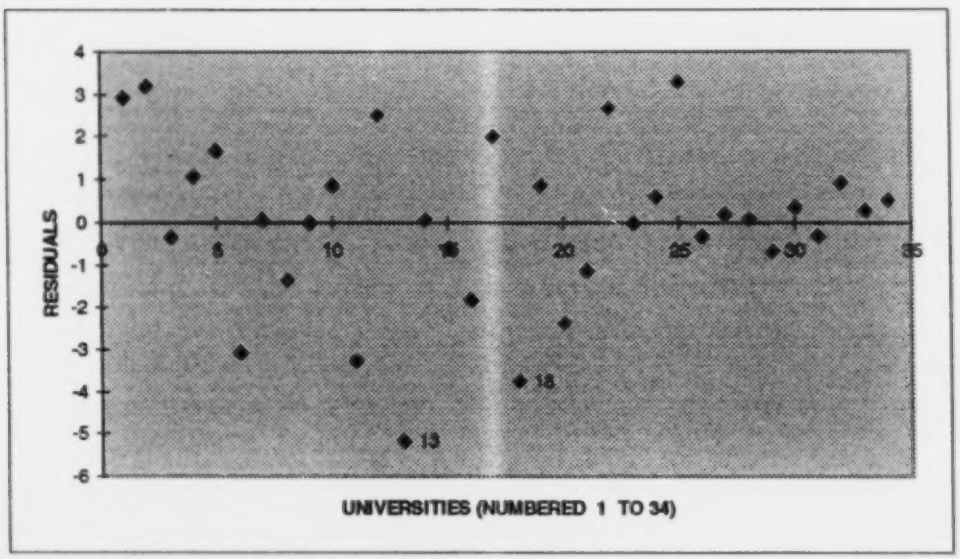

FIGURE 3 - RESIDUAL PLOT AGAINST PREDICTED RESOURCES FOR RESEARCH USING PERFORMANCE INDICATORS FROM 1992/93

The above distribution of the residuals plotted against independent variables shows the three most scattered universities. Number 14 received £-5.17 thousand less per academic staff than its predicted amount and the number 18, £-3.74 thousands per academic staff.

IMPLICATIONS

The results of the multiple regression analysis showed that the UFC used its funding formula to allocate research grants to the 50 UK long-established universities. The statistical results showed most of the grants allocated to universities were in accordance with the performance indicators presented in the UGC and UFC Circular Letters. There was a large coefficient of multiple determination in the three years under examination. In 1990/91 it was 73.1%, in 1991/92, 80.9% and in 1992/93, 86.2%. These figures showed that a large proportion of research grants could be explained by those performance indicators. These increasing coefficients point to an increased use of selectivity in funding research. The same set of performance indicators (Research Ratings, income from Research Council, Charitable Organisations, European Community and Central Government Departments) was considered statistically significant in the three regression analysis models. The last one resources from Central Government Departments was included in the regression models in the first and second year, but not in the third. Weighted student numbers was included in the model by the first time in the third year.

The results point to increasing selectivity in grant allocation, although in the context of more than a decade of financial constraints. While in the first year under analysis the allocation of 26.9% of resources for research was due to other factors, in the last year this figure was reduced to 13.8%. There were three most significant variables used during the three years under analysis: Research Ratings, Research Councils and European Community, in order of significance to the regression models. This means that a cost centre that invests highly in them, especially in Research Ratings, would obtain more resources for research from Funding Councils. Research Ratings that had increasing significance in the models of regression analysis for 1990/91, 1991/92 and 1992/93. It corroborates the statements made by the Funding Councils in the Circular Letters to Vice-chancellors and Principals.

The graphs of residuals showed a normal dispersion. The residuals were obtained by subtracting predicted values from observed values. The coefficient of multiple determination for each academic year under analysis was large but not equal to 100%. Therefore there were residuals above and below zero, in acceptable levels, that means less than four standard deviations. They showed that several institutions received some more resources than predicted by the model of multiple regression analysis. Others suffered more from reductions in grants than others. It means that the UFC did not follow up the funding formula strictly. The universities that received more resources than predicted were not with the highest reputation in the research assessment exercise or in attracting more non-Exchequer resources such as Oxford, Cambridge and London. Nevertheless, over the period of the analysis, the grants allocated to research became increasingly more related to the UFC chosen performance indicators.

CONCLUSION

Since 1980/81, allocation of Exchequer Grants to universities has decreased in relation to their Total Recurrent Income whereas the resources from non-governmental sources have increased. Exchequer Grants represented 62.9% of the Total Recurrent Income in 1980/81 and only 33.3% in 1992/93. Non-Exchequer Grants have increased continuously to cover university expenditure. Overseas students have been charged full fees, home student fees have also increased. The total research grants and contracts show that since 1980/81 grants from different sources have complemented the university budget. In relation to the total of research grants and contracts, Research Councils have had a more important role in the distribution of grants for research since the 1980s. The universities have shown a continuing increase in relation to the UFC chosen performance indicators, including quality of university research measured through UK research assessment exercises from 1989 and 1992, by institution.

The funding methodology of UK universities changed from a subjective funding system to an objective funding formula. In the previous funding system the UGC used to cover the gap between the resources of each university and the total budget, including their former and different commitments. In 1986 a funding formula for research

was introduced by the University Grants Committee (UGC). The successor of the UGC, the University Funding Council, followed the same funding formula, but complete data for testing the relationship between research grants and performance indicators were only available for 1990/91, 1991/92 and 1992/93 academic years.

Multiple regression analysis was used to test the relationship between grants and the performance indicators that formed the funding formula. The results lead to the conclusion that the distribution of grants for research between the 50 UK long-established universities followed those performance indicators to great extent. They showed that there was an increasingly selective allocation of grants according to university performance. Although the relationship was high, there were some residuals, at acceptable levels, in relation to observed amount of research grant allocated and the amount predicted by the regression analysis. Therefore, some universities received more and others less than their predicted amount. Such results show that the funding formula was used, but not strictly.

The most important performance indicators across the three academic years analysed were: Research Ratings, the capability in attracting grants from Research Councils, and grants from European Community, in order of statistical significance. These results showed increasing importance placed on research ratings in the process of grant allocation from 1990/91 to 1992/93, when, in the last year it became the most important performance indicator of the regression model. The results also showed that increased performance mainly in Research Ratings, and in grants from Research Councils and European Community would theoretically improve chances of the university receiving more research grants from Exchequer Grants.

It is worthwhile to observe that there was a double counting in some components of the funding methodology. The amount of non-Exchequer resources and research student numbers were computed in the national research assessment exercise and in the annual allocation of grants through the funding formula. It points to an over emphasis on market competition for resources, in which income figures have been used as performance indicators. Except for Research Ratings, the performance indicators used in the funding formula are only 'inputs' into research production instead of 'outputs'. The Funding Council should have taken into account universities' differences in size, subject area and mission, reputation, etc. Although the aim of this paper was only to test the Funding Council methodology used for research, it is necessary to develop new performance indicators, considering expected

'outputs' according to the 'inputs' received by each university, Johnes and Taylor (1990). It would measure university performance and accomplish the published aim of reinforcing quality.

The use of the UGC funding methodology for research introduced hard competition between universities for a reduced amount of public resources. In order to avoid loss of grants, departments have been compelled to grow, although growth would not necessarily mean more money. However, they have no choice but to try to increase their research ratings, income from private sources and research councils, the number of their research students and academic teachers paid from government resources. In order to keep costs down and to increase competitiveness between universities, some negative consequences can be expected. Increases in academic staff numbers would increase university salary costs. Increases in research students could overcrowd departments with limited supervision and space availability. Financial constraints also affect student relationships with academic staff. The selective approach placed considerable pressure on universities to abolish tenure in new contracts and also on research productivity, as the ability to attract resources has increasingly dependent on quality of research. An extreme example of the pressure on research performance is the latest attempt of the University of Nottingham in improving ratings for the next research assessment exercise. It has fixed a deadline of next September for the voluntary dismissal of 50 academics who are not able to reach a rating of four in their individual research plans, Utley (1997). Such an example was already followed by the University of Glasgow. The Glasgow's Principal also announced that 'under-performing' academics could loss their jobs to improve research ratings, Wojtas (1997).

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